# epreciation and

### Syllabus topic — F3 Depreciation and loans

This topic will develop your understanding of reducing balance loans and that an asset may depreciate over time rather than appreciate.

### **Outcomes**

- Calculate the depreciation of an asset using declining-balance method.
- Solve practical problems involving reducing-balance loans.
- Solve problems involving credit cards.
- Interpret credit card statements.
- Identify the various fees and charges associated with credit card usage.

### **Digital Resources for this chapter**

In the Interactive Textbook:

- Videos
- Literacy worksheet
- Desmos widgets
- Spreadsheets
- Study guide
- Quick Quiz Solutions (enabled by teacher)

- In the Online Teaching Suite:
- **Teaching Program** Tests
- Review Quiz
   Teaching Notes



### **Knowledge check**

The Interactive Textbook provides a test of prior knowledge for this chapter, and may direct you to revision from the previous years' work.

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#### **Declining-balance depreciation 8**A

Declining-balance depreciation occurs when the value of the item decreases by a fixed percentage each time period. For example, if you buy a car for \$20000 and it depreciates by 10% each year then the value of the car after one year is 20000 - 2000 or 18000. After the second year the value of the car is 20000 - 1800 or 16200. Notice that the amount of depreciation has decreased in the second year. Depreciation calculations have similarities with compound interest, except that the depreciation is subtracted from the value not added to it.

### **DECLINING-BALANCE DEPRECIATION**

 $S = V_0(1 - r)^n$ 

- S Salvage value or current value of an item. Also referred to as the book value.
- $V_0$  Purchase price of the item. Value of the item when n = 0.
- r Rate of depreciation per time period expressed as a decimal.
- n Number of time periods.

### Example 1: Calculating the declining-balance depreciation

Eva purchased a new car two years ago for \$32000. During the first year it had depreciated by 25% and during the second it had depreciated 20% of its value after the first year. What is the current value of the car?

n = 1 into the formula.

and n = 1 into the formula.

7 Write the answer in words.

**1** Write the declining-balance depreciation formula.

**3** Evaluate the value of the car after the first year. **4** Write the declining-balance depreciation formula.

5 For the second year substitute  $V_0 = 24000$ , r = 0.20

**6** Evaluate the value of the car after the second year.

 $S = V_0 (1 + r)^n$ **2** For the first year, substitute  $V_0 = 32000$ , r = 0.25 and  $= 32000 \times (1 - 0.25)^1$ 

= \$24000

 $S = V_0(1 - r)^n$  $= 24000 \times (1 - 0.20)^{1}$ 

= \$19200 Current value is \$19200.

SOLUTION:



**8**A

**8**A

### **Example 2: Calculating the purchase price**

Angus buys a car that depreciates at the rate of 26% per annum. After five years the car has a salvage value of \$17420. How much did Angus pay for the car, to the nearest dollar?

### **SOLUTION:**

- 1 Write the declining-balance depreciation formula.
- Substitute S = 17420, r = 0.26 and n = 5 into the formula. 2
- 3 Make  $V_0$  the subject of the equation.
- 4 Evaluate.
- 5 Express the answer correct to the nearest whole dollar.
- Write the answer in words. 6

### Example 3: Calculating the percentage rate of depreciation

Madison bought a delivery van four years ago for \$27500. Using the declining-balance method for depreciation, she estimates its present value to be \$8107. What annual percentage rate of depreciation did she use? Answer to the nearest whole number.

#### SOLUTION:

- 1 Write the declining-balance depreciation formula.
- Substitute S = 8107,  $V_0 = 27500$  and n = 4 into 2 the formula.
- 3 Make  $(1 r)^4$  the subject of the equation.
- Take the fourth root of both sides. 4
- 5 Rearrange to make *r* the subject.
- Evaluate. 6
- Express the answer correct to the nearest whole number. 7

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8 Write the answer in words.





 $S = V_0 (1 - r)^n$ 

 $17420 = V_0 \times (1 - 0.26)^5$ 

 $V_0 = \frac{17420}{\left(1 - 0.26\right)^5}$ 

= \$78504

= \$78503.59621

Angus paid \$78504 for the car.

$$S = V_0 (1 - r)^n$$
  

$$8107 = 27500 \times (1 - r)^n$$
  

$$1 - r)^4 = \frac{8107}{27500}$$
  

$$1 - r = \sqrt[4]{\frac{8107}{27500}}$$

$$r = 1 - \sqrt[4]{\frac{8107}{27500}}$$

$$= 0.263\,145\,28 \\= 26\%$$

Rate of depreciation is 26%.

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### **Exercise 8A**

Example 1

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A motor vehicle is bought for \$22000. It depreciates at 16% per annum and is expected to be used for 5 years. What is the salvage value of the motor vehicle after the following time periods? Answer to the nearest cent.

- **a** 1 year
- **b** 2 years
- **c** 3 years
- 2 Emma purchased a used car for \$6560 two years ago. Use the declining-balance method to determine the salvage value of the used car if the depreciation rate is 15% per annum. Answer to the nearest dollar.
- **3** Bailey purchased a motor cycle for \$17500. It depreciates at 28% per year. Answer to the nearest dollar.
  - **a** What is the book value of the motor cycle after 3 years?
  - **b** How much has the motor cycle depreciated over the 3 years?
- 4 A new car is bought for \$52000. It depreciates at 22% per annum and is expected to be used for 4 years. How much has the car depreciated over the 4 years? Answer to the nearest dollar.
- 5 Chloe purchased a car for \$19900. It depreciates at 24% per year. Answer to the nearest dollar.
  - **a** What is the salvage value of the car after 5 years?
  - **b** How much has the car depreciated over the 5 years?
- 6 The depreciation of a used car over 4 years is shown in the graph below.



- **a** What is the initial value of the used car?
- **b** How much did the used car depreciate during the first year?
- **c** When is the value of the used car \$2000?
- **d** When is the value of the used car \$1500?
- **e** What is the value of the used car after 4 years?
- **f** What is the value of the used car after  $1\frac{1}{2}$  years?

- Example 2 7 A hatchback was purchased for \$16980 three years ago. By using the declining-balance method of depreciation, find the current value of the hatchback if the annual percentage rate of depreciation is 17.27%. Answer to the nearest dollar.
  - **8** A new car is valued at \$35000. It has a rate of depreciation of 27.14%.
    - **a** What is the value of the new car after one years?
    - **b** What is the value of the new car after three years?



- **Example 3** 9 Philip bought a luxury car that depreciates at the rate of 8.9% per annum. After five years the car has a salvage value of \$104350. How much did Philip pay for the car, to the nearest dollar?
  - **10** Mary bought a new car for her business. It depreciates at the rate of 11% per annum. After four years the car has a salvage value of \$16240. How much did Mary pay for the car, to the nearest dollar?
  - **11** A motor vehicle is bought for \$32000. It depreciates at 16% per annum and is expected to be used for 8 years.
    - a How much does the motor vehicle depreciate in the first year?
    - **b** Copy and complete the following depreciation table for the first five years. Answer to the nearest dollar.

Year	<b>Current value</b>	Depreciation	Depreciated value
1			
2			
3			
4			
5			

**c** Graph the value in dollars against the age in years.

**8B** 

### 8B Reducing-balance loans

Reducing-balance loans are calculated on the balance owing and not on the initial amount of money borrowed as with a flat-rate loan ('flat' meaning the interest rate does not change during the life of the loan). As payments are made, the balance owing is reduced and therefore the interest charged is reduced. This can save thousands of dollars on the cost of a loan. The calculations for reducingbalance loans are complicated and financial institutions publish tables related to loans.



### LOAN REPAYMENTS

Total to be paid = Loan payment  $\times$  Number of repayments Total to be paid = Principal + Interest

### Example 4: Using a table for a reducing-balance loan

The table below shows the monthly repayments for a reducing-balance loan. Calculate the amount of interest to be paid on a loan of \$200000 over 13 years.

		Amount o	of the loan	
Term	\$100000	\$150000	\$200000	\$250000
12 years	\$1664	\$2096	\$2794	\$3493
13 years	\$1700	\$2150	\$2856	\$3569
14 years	\$1726	\$2218	\$2898	\$3622

### SOLUTION:

- 1 Loan is \$200000 and time period is 13 years.
- **2** Find the intersection value from the table (\$2856).
- 3 Multiply the intersection value by the number of years and 12 (months in a year) to determine the total to be paid.
- **4** Substitute the total to be paid (\$445536) and principal (\$200000) into the formula.
- **5** Evaluate.
- **6** Write the answer in words.

Total to be paid = Loan payment × Number of repayments

 $= 2856 \times 13 \times 12$ = \$445536

Total to be paid for the loan is \$445536.

Total to be paid = Principal + Interest

 $445\,536 = 200\,000 + I$ 

= \$245536

Interest paid is \$245536.

### Example 5: Using a table for a reducing-balance loan

The table shows the monthly payments for each \$1000 borrowed. Molly is planning to borrow \$280000 to buy a house at 8% per annum over a period of 20 years.

Interest note	Period of loan				
Interest rate	10 years	15 years	20 years		
6% p.a.	\$11.10	\$8.44	\$7.10		
7% p.a.	\$11.61	\$9.00	\$7.75		
8% p.a.	\$12.13	\$9.56	\$8.36		

- **a** What is Molly's monthly payment on this loan?
- **b** How much would Molly pay in total to repay this loan?
- **c** How much would Molly save if she repaid the loan over 15 years?

#### SOLUTION:

1	Find the intersection value from the	а	\$8.36
	table for interest rate 8% p.a. and time		
	period 20 years.		
2	Multiply the intersection value by the		Monthly repayment = $\$8.36 \times 280$
	number of thousands borrowed (280).		= \$2340.80
3	Multiply the monthly repayment by the	b	Total to be paid
	number of years and 12 (months in a		$=$ Loan repayment $\times$ Number of repayments
	year) to determine the total to be paid.		$= 2340.80 \times 20 \times 12$
4	Evaluate.		= \$561792
5	Write the answer in words.		Total to be paid for the loan is \$561792.
6	Repeat the above calculations using	C	15 years
	15 years instead of 20 years.		Monthly repayment = $9.56 \times 280$
			= \$2676.80
			Total to be paid
			= Loan repayment $\times$ Number of repayments
			$= 2676.80 \times 15 \times 12$
			= \$481824
7	Subtract the total to be paid for 15 years		Amount saved = $$561792 - $481824$
	from the total to be paid for 20 years.		
8	Evaluate.		= \$79968
9	Write the answer in words.		The amount saved is \$79968.

8B

### Fees and charges for a loan

Banks and financial institutions charge their customers for borrowing money. A loan account is created and an account service fee is charged per month. In addition to this fee there are a number of other loan fees and charges, depending on the financial institution. Many of these fees are negotiable and customers are advised to compare the fees and charges with the interest rate charged. Fees and charges for a loan may include:

- loan application fee costs in setting up the loan.
- loan establishment fee initial costs in processing the loan application.
- account service fee ongoing account-keeping fee.
- valuation fee assessment of the market value of a property.
- legal fee legal processing of a property.

### Graph of a reducing-balance loan

The graph below shows the amount owed after each month on a reducing-balance loan. The amount borrowed is \$50000 at an interest rate of 10% p.a. It illustrates the difference between making repayments of \$500 per month and making repayments of \$1000 per month. When paying \$500 a month, it takes 215 months to pay off the loan, and the interest charged is \$57500. However, when paying \$1000 a month, it only takes 65 months to pay off the loan, and the interest charged is \$15000. Each graph is a gradual curve as each payment reduces the amount owed and slowly decreases the interest charged.



Reducing-balance loan

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\$150000

\$3180

### Exercise 8B

Term

5 years

Example 4 Tyler is considering an investment loan from the bank at an interest rate of 9.9% p.a. reducible. The table below shows the monthly repayment for an investment loan.

**Investment** loan

\$100000

\$2120

10 years	\$658	\$987	\$1316	\$1645	\$1974
15 years	\$534	\$801	\$1068	\$1336	\$1603

\$75000

\$1590

**a** What is the monthly repayment for a loan of \$75000 over 15 years?

- **b** What is the monthly repayment for a loan of \$150000 over 10 years?
- **c** What is the monthly repayment for a loan of \$100000 over 5 years?
- **d** What is the monthly repayment for a loan of \$50000 over 15 years?
- **e** What is the monthly repayment for a loan of \$125000 over 5 years?
- 2 Kevin is applying for an investment loan from a bank of \$75000 over 5 years using the table in question 1.

\$50000

\$1060

- **a** What is the monthly repayment?
- **b** What is the total amount paid for this loan?
- **c** What is the interest paid on this loan?



\$125000

\$2650

3 The table below shows the monthly repayments per \$1000 on a bank loan.

Term	7.00%	7.25%	7.50%	7.75%
10 years	\$16.39	\$16.78	\$17.18	\$17.58
15 years	\$15.33	\$15.87	\$16.44	\$17.02

Calculate the monthly repayment on the following loans.

- **a** \$310000 at 7.50% p.a. for 15 years
- **c** \$450000 at 7.75% p.a. for 10 years
- **b** \$120000 at 7.00% p.a. for 10 years
- **d** \$180000 at 7.25% p.a. for 15 years
- Blake is borrowing \$35000 at 7% p.a. for 10 years. Use the table in question 3 to answer these 4 questions.
  - **a** What is the monthly repayment?
- **b** How much interest will he pay?

Example 5 5

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**5** The table below shows the monthly payments for a loan of \$1000 for varying interest rates. Jack is planning to borrow \$340000 to buy a house at 10% p.a. over a period of 15 years.

Interest note	Period of loan			
Interest rate	10 years	15 years	20 years	
7% p.a.	\$11.61	\$9.00	\$7.75	
8% p.a.	\$12.13	\$9.56	\$8.36	
9% p.a.	\$12.67	\$10.14	\$9.00	
10% p.a.	\$13.22	\$10.75	\$9.65	

- a Calculate Jack's monthly payment on this loan.
- **b** How much does Jack pay in total to repay this loan?
- **c** How much interest does Jack pay on this loan?
- **d** How much would Jack save if he repaid the loan over 10 years?
- 6 Hannah and Mitchell borrow \$180000 over 20 years at a reducible interest rate of 8.5% p.a. They pay \$1754 per month.
  - **a** Calculate the total amount to be paid on this loan.
  - **b** How much interest do they pay on the loan?
- 7 The graph opposite shows the amount owed each month on a reducing-balance loan. Use the graph to estimate the answer to these questions.
  - a How much was borrowed?
  - **b** How much is owed after 20 months?
  - **c** How much is owed after 40 months?
  - d How much is owed after 60 months?
  - e When is the amount owing \$20000?
  - f When is the amount owing \$60000?
  - **g** When is the loan paid?





### **8C** Credit cards

Credit cards are used to buy goods and services and pay for them later. The time when interest is not charged on your purchases is called the interest-free period. If payment is not received when the statement is due then interest is charged from the date of purchase. Interest on credit cards is usually calculated daily on the outstanding balance using compound interest.

The interest rate is usually much higher than for other kinds of loans and credit facilities.



#### **CREDIT CARDS**

Daily interest rate =  $\frac{\text{Annual interest rate}}{365}$ 

 $FV = PV(1+r)^n \quad I = FV - PV$ 

FV - Amount owing on the credit card

- PV Principal is the purchases made on the credit card plus the outstanding balance
- r Rate of interest per compounding time period expressed as a decimal
- n Number of compounding time periods
- I Interest (compound) charged on the outstanding balance

#### Example 6: Calculating the cost of using a credit card

Samantha has a credit card with a compound interest rate of 18% p.a. and no interest-free period. Samantha used her credit card to pay for clothing costing \$280. She paid the credit card account 14 days later. What is the total amount she paid for the clothing, including the interest charged?

#### **SOLUTION:**

- **1** Write the formula for compound interest.
- 2 Substitute P = 280,  $r = (0.18 \div 365)$  and n = 14 into the formula.
- **3** Evaluate.
- 4 Express the answer correct to two decimal places.
- **5** Answer the question in words.

 $FV = PV(1 + r)^{n}$ = 280\left(1 + \frac{0.18}{365}\right)^{14}

= 281.9393596 = \$281.94 Clothing costs \$281.94





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### Exercise 8C

- 1 A credit card has a daily interest rate of 0.05% per day. Find the interest charged on these outstanding balances. Answer correct to the nearest cent.
  - **a** \$840 for 12 days
  - **b** \$742.40 for 20 days
  - **c** \$5680 for 30 days
  - **d** \$128 for 18 days
  - **e** \$240 for 6 days
  - **f** \$1450 for 15 days

#### Example 6 2

Joel has a credit card with an interest rate of 0.04% compounding per day and no interest-free period. He uses his credit card to pay for a mobile phone costing \$980. Calculate the total amount paid for the mobile phone if Joel paid the credit card account in the following time period. Answer correct to the nearest cent.

- **a** 10 days later **b** 20 days later
- **c** 30 days later **d** 40 days later
- **e** 50 days later **f** 60 days later



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- **3** Calculate the compound interest charged on these outstanding balances. Answer correct to the nearest cent.
  - **a** Balance = 6820, Daily interest rate of 0.08%, Time period 70 days
  - **b** Balance = \$23648, Daily interest rate of 0.06%, Time period 35 days
  - **c** Balance = \$1550, Daily interest rate of 0.05%, Time period 20 days
  - **d** Balance = 35800, Daily interest rate of 0.09%, Time period 100 days
  - **e** Balance = 4500, Daily interest rate of 0.05%, Time period 27 days
  - **f** Balance = \$7680, Daily interest rate of 0.04%, Time period 180 days
- 4 Andrew's credit card charges 0.045% compound interest per day on any outstanding balances. How much interest is Andrew charged on an amount of \$450, which is outstanding on his credit card for 35 days? Answer correct to the nearest cent.
- 5 Olivia received a new credit card with no interest-free period and a daily compound interest rate of 0.05%. She used her credit card to purchase food for \$320 and petrol for \$50 on 18 July. This amount stayed on the credit card for 24 days. What is the total interest charged? Answer correct to the nearest cent.
- 6 Jett used his credit card to buy a holiday to New Zealand. The cost of the package was \$6500. The charge on the credit card is 1% interest per month on the unpaid balance. How much does Jett owe for his holiday after six months? Answer correct to the nearest cent.

- 7 Calculate the amount owed, to the nearest cent, for each of the following credit card transactions. The credit card has no interest-free period.
  - **a** Transactions = \$540, Compound interest rate = 14% p.a., Time period = 15 days
  - **b** Transactions = \$270, Compound interest rate = 11% p.a., Time period = 9 days
  - **c** Transactions = 1400, Compound interest rate = 18% p.a., Time period = 22 days
  - **d** Transactions = 480, Compound interest rate = 16% p.a., Time period = 18 days
  - **e** Transactions = 680, Compound interest rate = 10% p.a., Time period = 9 days
- 8 Calculate the interest charged for each of the following credit card transactions. The credit card has no interest-free period. Answer correct to the nearest cent.
  - **a** Transactions = 680, Compound interest rate = 15% p.a., Time period = 20 days
  - **b** Transactions = \$740, Compound interest rate = 12% p.a., Time period = 13 days
  - **c** Transactions = \$1960, Compound interest rate = 17% p.a., Time period = 30 days
  - **d** Transactions = \$820, Compound interest rate = 21% p.a., Time period = 35 days
  - **e** Transactions = \$1700, Compound interest rate = 19% p.a., Time period = 32 days
- **9** Luke has a credit card with a compound interest rate of 18.25% per annum.
  - **a** What is the daily percentage interest rate, correct to two decimal places?
  - **b** Luke has an outstanding balance of \$4890 for a period of 30 days. How much interest, to the nearest cent, will he be charged?
- **10** Alyssa uses a credit card with a no interest-free period and a compound interest rate of 15.5% p.a. from the purchase date. During April she makes the following transactions.

Transaction details			
04 April	IGA Supermarket	\$85.00	
09 April	KMart	\$115.00	
12 April	David Jones	\$340.00	
27 April	General Pants	\$80.00	
28 April	JB HiFi	\$30.00	

- **a** What is the daily compound interest rate, correct to three decimal places?
- **b** Alyssa's account is due on 30 April. What is the total amount due if you disregard the amount of interest to be paid?
- **c** How much interest has Alyssa paid on the IGA transaction during the month? Answer correct to the nearest cent.
- **d** How much interest has Alyssa paid on the KMart transaction during the month? Answer correct to the nearest cent.

### 8D Credit card statements

Credit card statements are issued each month and contain information such as account number, opening balance, new charges, payments, refunds, reward points, payment due data, minimum payment and closing balance. The credit card statement includes the date and cost of each purchase and could be regarded as a ledger. A ledger documents your spending.

If the minimum payment is not made by the due date, the consequences can be expensive. You may be charged a late payment fee and, of course, you will be charged interest on it.

### Example 7: Reading a credit card statement

Your Bank Your Bank of Australia Page number 1 of 2 ABN 12 345 678 901 Statement begins 5 Oct Statement ends 5 Nov Enquiries MR JOHN CITIZEN **Credit Card** 13 2221 123 SAMPLE STREET (24 hours a day, 7 days a week) SUBURBIA NSW 2000 Your Bank Awards 131661 (8am to 8pm Mon-Fri) MasterCard 5353 1801 0001 0001 Payment due date 30th November Opening balance \$207.72 New charges \$460.14 Minimum payment \$25.00 Payments/refund -\$207.72 Closing balance \$460.14 Your Bank Awards 1000123456 **Total Points Balance** Opening points balance 50,500 34,910 Total points earned 460 points redeemed -15,600

Answer the following questions using the above credit card statement.

- **a** What is the credit card account number?
- **c** What is the payment due date?
- **e** What is the closing balance?

### SOLUTION:

- 1 Read the number after 'MasterCard'.
- **2** Read 'Opening balance'.
- **3** Read the box 'Payment due date'.
- 4 Read the box 'Minimum payment'.
- **5** Read the box 'Closing balance'.

- **b** What is the opening balance?
- **d** What is the minimum payment?
- **a** 5353 1801 0001 0001
- **b** Opening balance is \$207.72.
- **c** Payment due date is 30 Nov.
- **d** Minimum payment is \$25.00.
- e Closing balance is \$460.14.

**8D** 

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### Exercise 8D

1

Use the credit card statement opposite to answer these questions.

- **a** What is the due date?
- **b** What is the cost of the purchases?
- **c** What is the closing account balance?
- **d** What is the minimum amount due?
- What payment was made last month?
- f How much interest was charged?
- **g** What was the opening balance?
- **h** What is the cardholder's credit balance?
- 2 The transactions on a credit card are shown below.
  - **a** What is the credit limit?
  - **b** What is the account balance?
  - **c** How many transactions are shown?
  - **d** What is the available credit?

Account summary	
<b>Opening balance</b>	\$743.42
Payments and other credits	\$743.42
Purchases	\$172.91
Cash advances	\$0.00
Interest and other charges	\$0.00
Closing account balance	\$172.91
Cardholder credit balances	4511.88
Payment summary	
Card balances renewal	\$4684.79
Monthly payment	\$10.00
Due date	21 Apr
Minimum amount due	\$10.00

Account summary					
Available credit	Account balance		Credit limit		
\$15549.18	\$3950.82		\$19500.00		
	Payment due date		Minimum payment due		
	7 Dec		\$57.00		
Last 5 transactions	s View more				
Date	Transaction description	Debit	Credit		
30 Nov	WW Petrol	\$24.38			
29 Nov	Coles	\$55.03			
29 Nov	Woolworths	\$34.63			
28 Nov	Myer	\$49.13			
28 Nov	David Jones	\$23.40			

- e How much was spent on 29 November?
- f How much was spent on 28 November?
- g Where was \$49.13 spent on 28 November?
- h Where was \$24.38 spent on 30 November?
- i What is the payment due date?
- j What is the minimum amount due?

**3** Create the spreadsheet below.



	C10 -	f <sub>x</sub> =SUM(C5:C9)	
	А	В	С
1			
2	Worksheet to c	reate a ledger	
3			
4	Date	Details	Amount
5	20-Nov	Manly Vale Pharmacy Manly Vale	-\$20.00
6	25-Nov	Manly Vale Pharmacy Manly Vale	-\$18.95
7	01-Dec	Virgin Mobile North Sydney	-\$25.00
8	05-Dec	Target 78 Brookvale	-\$12.99
9	05-Dec	Pulse Warringah Brookvale	-\$30.98
10			-\$107.92

- a How many transactions are shown on the ledger?
- **b** How much has been spent at Manly Vale Pharmacy?
- **c** If the account begins on 15 November and ends on 14 December, how many days does it account for?
- d If the card has a \$5000 credit limit, what is the available credit on 14 December?
- **e** If the minimum payment is \$10 and is paid on the due date, what is the balance owing?
- f This credit card charges 0.06% per day compound interest on the unpaid balance. What is the interest charged per day on the closing balance? Answer to the nearest cent.

#### 4 Consider the credit card statement shown opposite.

- **a** What is the opening balance?
- **b** What is the credit limit?
- **c** What is the available credit?
- **d** What is the closing balance?
- e How much has been spent on purchases, cash advances and special promo debits this month?
- f How much interest and other charges were incurred last month?

Visa Account number	4557 0756 0833 1234
Credit limit	\$12,000
Available credit	\$6, 361
Account summary	
– Opening balance	\$5, 821.31 DR
+ Payment & other credits received	\$781.25 CR
<ul> <li>Purchases, cash advances &amp; special promo debits</li> </ul>	\$511.93DR
- Interest & other charges	\$86.26DR
= Closing balance	\$5, 638.25 DR

This credit card charges 0.05% per day compound interest on the unpaid balances.

- g What is the interest charged per day on the closing balance? Answer to the nearest cent.
- **h** How much interest would be accrued on the closing balance for a year? Answer to the nearest cent.

Cambridge Maths Stage 6

### 8E Fees and charges for credit card usage

Banks and financial institutions charge their customers an annual card fee for maintaining a credit card account. In addition to this fee, customers may be charged fees for late payment, cash advances and balance transfers. The late payment fee applies if the minimum payment has not been received by the due date. Interest is charged for retail purchases and the amount still owing from the previous month.

### FEES AND CHARGES FOR CREDIT CARD USAGE

- Annual card fee maintaining credit card account
- Interest charge interest charged for retail purchases
- Late payment fee when minimum payment has not been received by the due date
- Cash advances withdrawing cash from the credit card account
- Balance transfers moving balance to another account, often held at another institution

#### Example 8: Calculating fees and charges

Hilary has a debit of \$6000 on a credit card with an interest rate of 14.75% p.a. that compounds daily. She decided to transfer the balance to a new card with a 0% balance transfer for 6 months. However, after 6 months the new card reverted to an interest rate of 19.75% p.a that compounds daily. Is Hilary better off after 12 months?

#### **SOLUTION:**

- **1** Write the formula.
- 2 Substitute PV = 6000, r = 0.1475 and n = 365 into the formula.
- **3** Evaluate correct to two decimal places.
- **4** Write the formula.
- 5 Substitute PV = 6000, r = 0.1975 and n = 182.5 (6 months only) into the formula.
- **6** Evaluate correct to two decimal places.
- 7 Calculate the saving by subtracting the future value of the new card from the old card.
- 8 Write the answer in words.



Old card 
$$FV = PV(1 + r)^n$$
  
=  $\$6000 \left(1 + \frac{0.1475}{365}\right)^{365}$   
 $\approx \$6953.39$ 

New card 
$$FV = PV(1 + r)^n$$
  
=  $\$6000 \left(1 + \frac{0.1975}{365}\right)^{182.5}$   
 $\approx \$6622.57$ 

Saving = \$6953.39 - \$6622.57 = \$330.82

Hilary is better off with the new card by \$330.82.

### Exercise 8E

Example 8

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Alicia's bank charged an annual credit card fee of \$350, a cash advance fee of \$2.50 and a late payment fee of \$20. Calculate Alicia's banking costs for the year if she made:

- a 11 cash advances and 4 late payments
- **b** 20 cash advances and 12 late payments
- **c** 50 cash advances and 6 late payments
- **d** 0 cash advances and 12 late payments
- e 100 cash advances and 0 late payments
- **f** 0 cash advances and 0 late payments.

Bank	Annual fee	Cash advance	Late payment
А	\$225	\$2.00	\$15
В	\$200	\$2.20	\$20
С	\$250	\$1.80	\$12
D	\$240	\$1.90	\$16

2 The table below shows the credit card usage charges for four banks.

- a What is the cost of the cash advance fee at bank B?
- **b** What is the cost of the late payment fee at bank D?
- **c** Which bank has the lowest annual fee?
- d Which bank has the highest cash advance fee?
- e Calculate the difference between the late payment fees at bank C and bank D.
- f Calculate the difference between the cash advance fees at bank B and bank C.
- **g** What is the average annual fee for these banks?
- **h** What is the average late payment fee for these banks?
- i What are the annual banking costs for 30 cash advances and 1 late payment at:
  - i Bank A?
  - ii Bank B?
  - iii Bank C?
  - iv Bank D?
- j What are the annual banking costs for 100 cash advances and 6 late payments at:
  - i Bank A?
  - ii Bank B?
  - iii Bank C?
  - iv Bank D?
- **3** Elijah's bank charged an annual credit card fee of \$320, cash advance fee of \$2.30 and late payment fee of \$18. What are Elijah's banking costs for the year if he made 80 cash advances and had 1 late payment fee?

Summary

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GUIDE

## Key ideas and chapter summary

Declining-balance depreciation	$S = V_0(1-r)^n$	S – Salvage value or current value $V_0$ – Purchase price of the item r – Rate of interest per time period (decimal) n – Number of time periods
Reducing-balance loans	Total to be paid = Lo Total to be paid = Pri	an repayment × Number of repayments incipal + Interest
Fees and charges for a loan	<ul> <li>Loan application fee</li> <li>Loan establishment</li> <li>Account service fee</li> <li>Valuation fee – asse</li> <li>Legal fee – legal press</li> </ul>	ee – costs in setting up the loan t fee – initial costs in process the loan application e – ongoing account-keeping fee. essment of the market value of a property. rocessing of a property.
Credit cards	Daily interest rate = $\frac{I}{r}$ $FV = PV(1 + r)^n$ and FV – Future value or PV – Present value or r – Rate of interest per n – Number of compo- I – Interest (compound	Annual interest rate 365 I = FV - PV the amount owing on the credit card the purchases made on the credit card or compounding time period as a decimal bunding time periods d) charged for the use of their credit card
Credit card statements	Credit card statements such as account numb refunds, reward points closing balance.	s are issued each month and contain information per, opening balance, new charges, payments, s, payment due data, minimum payment and
Fees and charges for credit card usage	<ul> <li>Annual card fee – r</li> <li>Interest charge – in</li> <li>Late payment fee – by the due date</li> <li>Cash advances – w</li> <li>Balance transfers – at another institution</li> </ul>	maintaining credit card account terest charged for retail purchases when minimum payment has not been received ithdrawing cash from the credit card account moving balance to another account, often held on

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### **Multiple-choice**

- A new car bought for \$39000 depreciates at 25% per annum and is expected to be used for 4 years. How much is the car worth after 4 years?
  - **A** \$9390 **B** \$9750 **C** \$12340 **D** \$29250
- 2 The table shows the monthly repayment of \$1000 on a reducing-balance loan. What is the monthly repayment on \$290000 at 8.75% for 20 years?

		Term	8.00%	8.25%	8.50%	8.75%	1
		20 years	\$6.38	\$6.77	\$7.17	\$7.57	
	<b>A</b> \$1850.20	В	\$1963.30		<b>C</b> \$2079.30		<b>D</b> \$2195.30
3	Lachlan borrow per month. What	vs \$245000 at is the tota	over 20 year l paid on thi	rs at a reduc s loan?	ible interest	rate of 6.5%	p.a. He pays \$1856
	<b>A</b> \$200440	В	\$318500		<b>C</b> \$445440		<b>D</b> \$563500
4	A credit card ha	as a compou l on \$4200 f	ind interest i for 30 days.	ate of 16% Answer corr	p.a. (no inter rect to the ne	est free perio arest dollar.	od). Find the
	<b>A</b> \$22	В	\$56		<b>C</b> \$674		<b>D</b> \$4256
5	A credit card ha	as a daily in 1 on \$1530 f	terest rate of for 14 days.	f 0.05% per Answer cori	day (no inter ect to the ne	est free peri arest cent.	od). Find the
	<b>A</b> \$0.77	В	\$10.74		<b>C</b> \$76.50		<b>D</b> \$1540.74
6	Elijah's bank cl payment fee of and had 1 late p	narged an ar \$18. What a payment fee	nnual credit are Elijah's l ?	card fee of \$ panking cost	320, cash ac s for the yea	lvance fee of r if he made	f \$2.30 and late 80 cash advances
	<b>A</b> \$202.00	В	\$340.30		<b>C</b> \$504.00		<b>D</b> \$522.00
7	Michael has a c decided to trans much does he s	lebt of \$160 sfer the bala ave in the fi	000 on a created on a created on a created on a new rst 12 month	dit card with a card with a dis if the new	a compound 0% balance card has an	l interest rate transfer for interest rate	e of 14% p.a. He 6 months. How of 16% p.a.?
	A 1008	В	\$1232		<b>5</b> \$2240		<b>J</b> \$18240

### 3/

**Review** 

### **Short-answer**

- 1 Alexis purchased a car for \$19900. It depreciates at 24% per year.
  - **a** What is the salvage value of the car after 5 years? Answer to the nearest dollar.
  - **b** How much has the car depreciated over the 5 years?
- **2** Paige takes out a loan of \$21000 over 36 months. The repayment rate is \$753.42 per month.
  - a How much will Paige pay back altogether? Answer to the nearest dollar.
  - **b** What was the interest charged on Paige's loan?
- **3** James borrows \$280000 and repays the loan in equal fortnightly repayments of \$1250 over 20 years. What was the interest charged on James's loan?
- 4 Madison has a credit card with an interest rate of 17% p.a. compounding daily and no interestfree period. Madison used her credit card to pay for shoes costing \$170. She paid the credit card account 26 days later. What is the total amount she paid for the shoes including the interest charged? Answer to the nearest cent.
- 5 Hayley's bank charged an annual credit card fee of \$300, a cash advance fee of \$4.00 and a late payment fee of \$20. Calculate Hayley's banking costs for the year if she made:
  a 9 cash advances and 5 late payments
  b 15 cash advances and 7 late payments.
- 6 Benjamin uses a credit card with a no interest-free period and a compound interest rate of 18.5% p.a. compounding daily from and including the purchase date and due date. Benjamin's account is due on February 28. During February he makes the following transactions.

Transaction Details			
06 February	Coles	\$278.00	
07 February	Myer	\$87.00	
18 February	Big W	\$259.00	
18 February	Jag	\$120.00	
20 February	Bunnings	\$460.00	
21 February	Woolworths	\$300.00	

How much interest will Benjamin pay during the month on the following transactions? Answer correct to the nearest cent.

- a Coles transaction
- **b** Big W transaction
- **c** Bunning transaction

Post date	Tran date	Description	Amount		
Derrick Tan 4512-XXXX-6650					
		Previous statement balance	3696.05		
31 May	26 May	Payment – Thank you	110.88CR		
15 Jun	15 Jun	Best Denki-Plaza	99.56		
15 Jun	15 Jun	Harvey Norman	\$104.08		
15 Jun	15 Jun	Finance charge	81.30		
Danielle Tan 4512-XXXX-7344					
13 Jun	13 Jun	IKEA	100.00		
		Total due	\$3970.11		

7 Transactions on a credit card with an interest rate of 20% p.a. are shown below.

- **a** What is the previous statement balance?
- **b** How much was paid on 26 May?
- **c** What is the balance owing on 1 Jun?
- **d** How much did Danielle Tan spend on 13 Jun?
- What is the balance owing on 14 Jun?
- f How much was spent at Harvey Norman on 15 Jun?
- **g** How much was the finance charge?
- **h** What is the closing balance?
- i How much interest would be paid on the closing balance for a year?
- j How much interest would be paid on the closing balance for two years?
- 8 Marcus has a debit of \$12000 on a credit card with an interest rate of 13% p.a. He decided to transfer the balance to a new card with a 0% balance transfer for 6 months. However, after 6 months the new card reverted to an interest rate of 21.25% p.a. Is Marcus better off after 24 months? Answer to the nearest dollar.
- **9** A credit card statement shows a closing balance of \$5620.60 and a charge of 0.06% per day compound interest on the unpaid balances. What is the interest charged per day on the closing balance? Answer to the nearest cent.



**10** Jenny's bank charged an annual credit card fee of \$400, cash advance fee of \$4.30 and late payment fee of \$14. What are Jenny's banking costs for the year if she made 80 cash advances and had 3 late payment fees?

Review